

Lessons Learnt: LSC Group - Implementing AP-239

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Structure of Presentation

- **Introduction**
- **Early Implementations**
- **Lessons Learnt**



The DML Group offers a complete range of design, build and support solutions across both defence and commercial sectors:

- front-end concept design, analysis and safety justification via the Frazer-Nash Consultancy
- specialised ship and superyacht design and build through its Appledore and Devonport facilities
- complete through-life support and asset management solutions from the LSC Group
- design services, deep maintenance and capability updates on nuclear-powered submarines and major surface warships, centred on its Devonport facility
- first and second level engineering services, infrastructure support, inventory management and distribution services for military assets
- prime design, supply, support and overhaul for complex naval equipment and systems
- specialist land systems vehicles
- overhaul, upgrade and engineering services for the rail industry
- structural strengthening solutions in high-duty composite materials

The DML Group
changing shape, shaping change

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FRAZER-NASH
CONSULTANCY

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APPLEDORE

DEVONPORT
YACHTS

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LSC

DML
DEVONPORT
RAIL SUPPORT

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DEVONPORT
COMPOSITES



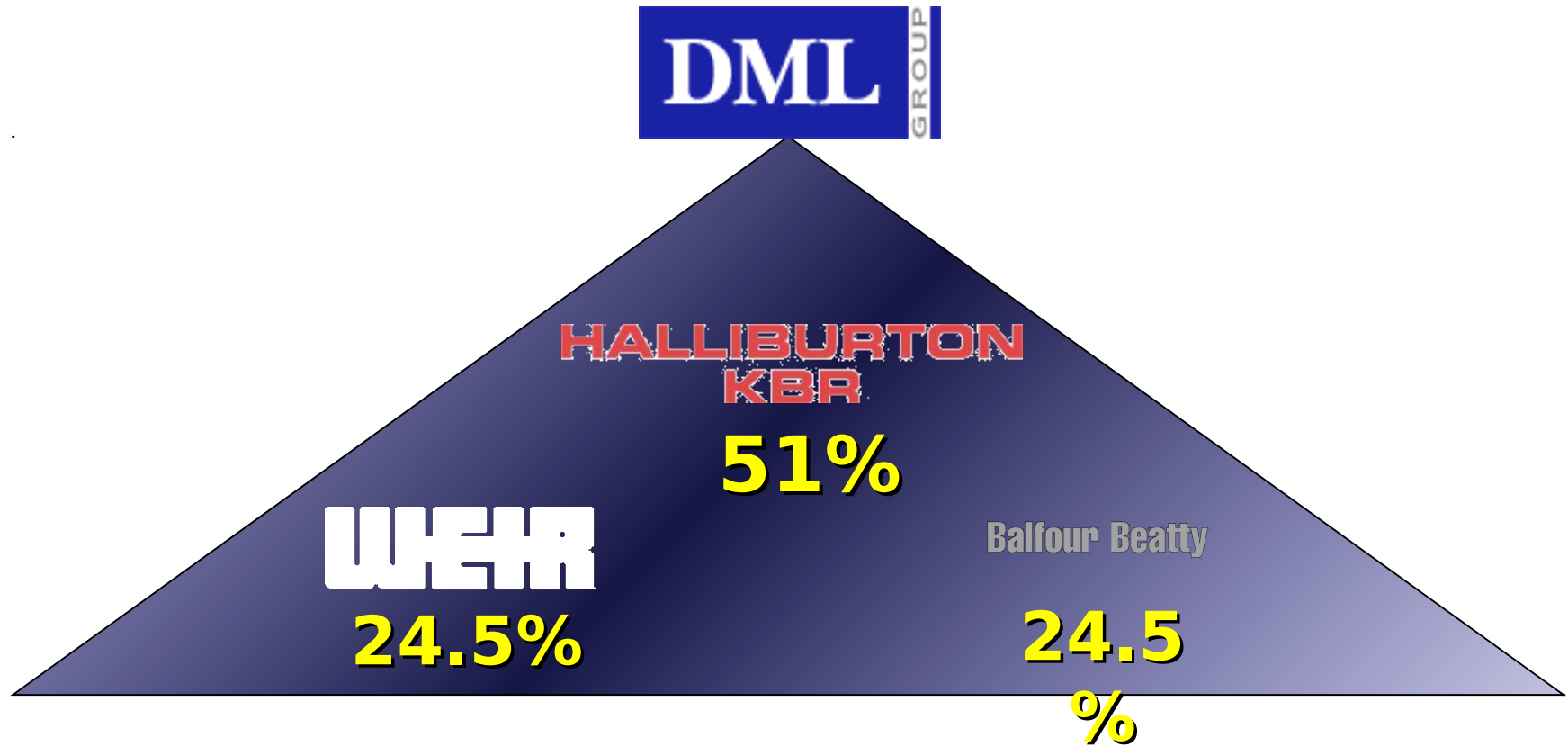
- Owner/operator of Devonport Royal Dockyard
- 25 years experience refitting/refuelling nuclear submarines
- 30 years experience of refitting/design of surface ships
- Design/build/refit of premium yachts
- Rail support/overhaul facilities



*PLCS: Keeping support information
aligned with a changing product over its
entire life cycle*

DML OWNERSHIP

Devonport Royal Dockyard Limited and LSC Group

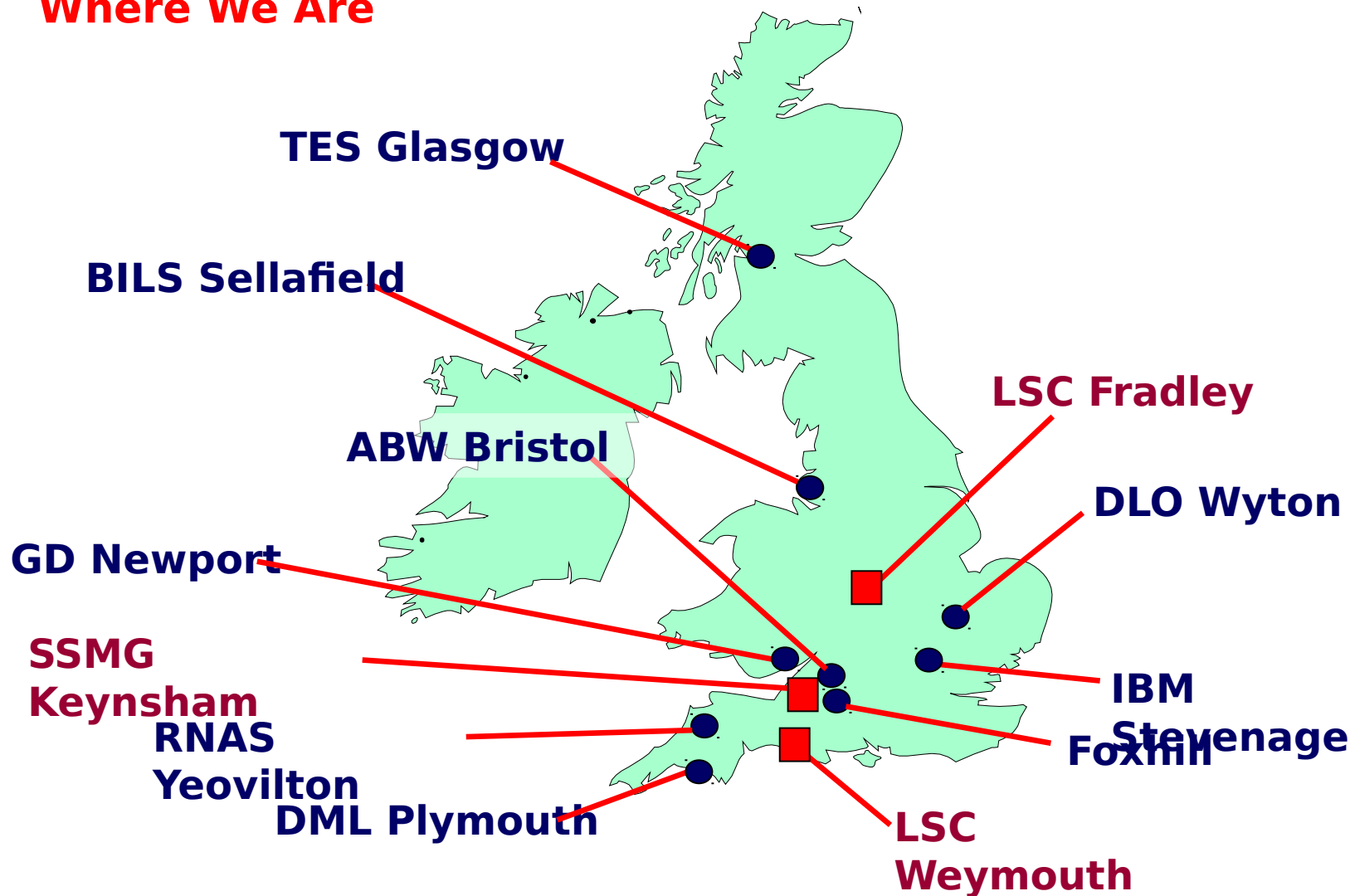


Company Background

- **Over 200 skilled and experienced staff across the UK**
- **Mixture of Industry, ex-Military and Academic personnel**
- **Wholly owned subsidiary of Devonport Management Limited (DML)**
- **Financial stability through DML & KBR**
- **Solutions, rather than products based**
- **Core focus - Defence and Public Sector Logistics**
- **One of Europe's leading providers of standards based logistics solutions**

***PLCS: Keeping support information
aligned with a changing product over its
entire life cycle***

Where We Are



Wide Range of Experience

Attack Helicopter

JCA Support Template

Land System Vehicles

Legacy Conversion

RN - Change Programme

Handbook Management

Line Items Database



Wide range of solutions

- Supportability solutions and tools to ensure an effective, affordable through-life support philosophy through all phases of a product's life cycle

RCM

Systems Modelling

Inventory Planning

Technical Publications

Obsolescence Management

Document Management

Asset Management

Lean Logistics Model



AP 239 Development

- **Key Features**
 - Product as Individual
 - Modules
 - Reference Data
 - DEXs

Early Implementations

- **Motivation**
- **Asset Management**
- **Contractor Logistic Support: Electronic Logbook**
- **Def Stan 00-60 - LSAR Mapping**
- **Work Package Management - UMMS**
- **Configuration Management - VMP**
- **TDP Handover - Framework for Interoperability**
- **Lean Logistics Model**

Early Implementations - Motivation

- **Motivation**
 - Implementation most compelling for take-up
 - Assess shortfalls
 - Determine if fit for purpose
- **The early implementations show how AP239:**
 - Can meet the business requirements
 - Can meet information requirements of target business processes
 - Is feasible in terms of available implementation technologies

Early Implementations - Asset Management

- **Asset Management - RB199 Tornado Aircraft Demonstrator**
- **2001 - Gave first confirmation of PLCS Deliverables**
- **Exchange of in-service configuration, maintenance tasks, feedback of engine fault data, design change, new work instructions, new part and permissible configuration**
- **Context:**
 - Design exists for engine currently under maintenance through RAF's Repairable Asset Management System (RAMS)
 - Routine maintenance records a crack in fan blade assembly which will need to be replaced
 - In-service engine configuration with fault record is exported from RAMS to PLCS and sent to Supplier
 - Part is replaced using the maintenance procedure, recording the new part number & serial numbers of the replacement in RAMS
 - OEM authorizes design change resulting in new work instructions and permissible builds for the engine (using new parts)
 - New part and permissible builds read into RAMS and work instruction to upgrade is carried out

Early Implementations: E-Logbook

Contractor Logistic Support: Electronic Logbook

- **PLCS important role when asset owners rely upon contractors for logistic support**
- **Context: Marine Gas Turbine Supplier moving from traditional spares support to a total-care-package.**
 - Supplier needs the CLS contract to run efficiently
 - AP-239 able to replace current physical collection of information accompanying engine
 - PLCS provides Product Configuration Information, allows history/life info storage
 - Equipment fitted to slots in the structure; can be removed/refitted as required.
 - Each operation recorded.
 - Removed item carries own usage info with it - to next location.
 - Parent carries record of which equipment fitted, when fitted & how much usage consumed while fitted
 - Owner gets access to product support info without being tied to supplier's software
 - Contractor gets access to product feedback which helps to provide approp. support
 - Typically 4 turbines per ship
- **Prototype On trial at HMS Sultan (RN MES)**

Early Implementations - Def.Stan 00-60

- **Defence Standard 00-60 - Specifies the Logistic Support Analysis Record (LSAR)**
 - Provides mechanism for extensive definition of Support Solutions, including;
 - identification of LSI within product
 - specification of appropriate tasks to maintain product
 - LSC mapped all elements of the LSAR (> 500 DED) to relevant ones in AP239 for MoD
 - Utility of AP-239 is one achievement
 - May also be basis for integrating support engineering into wider enterprise context
 - E.g. enables MoD to view total set of LSAR's for all acquisition projects
 - Also enables Integrated Project Teams (IPT) to import LSAR into other AP239 compliant applications (e.g. PDM or ERP).

Early Implementations - W.P Management

- **Work Package Management - UMMS**
- **Unit Maintenance Management System**
 - Implements principles of Reliability-Centred Maintenance (RCM) in UK Navy
 - Inc. UMMS Aboard (ship-based maintenance at sea) & shore-based system
 - Allows Navy to gather info across fleet
- **Challenge:**
 - UK Government no longer own a dockyard with capabilities to perform repair & overhaul of Navy vessels, and
 - Privatised dockyards operate independent work planning systems
 - Hence MoD face data exchange problem with each dockyard used.
- **Prime PLCS target**
 - LSC has produced a capability to generate Work Packages in AP239 format to use with yards.
 - XML viable solution

Early Implementations - Config. Mgt.

- **Configuration Management - VMP**
- **Challenge:**
 - MoD using Submarine Definition Database (SDD)
 - Dockyard using Vessel Material Planning system (VMP)
- **LSC verified PLCS supports all necessary capability to represent the Master Configuration Record of a submarine**
- **AP239 can also represent the complex Fleet Area code**
 - Code is a hybrid of product structure, using physical, zonal and system elements

Early Implementations - TDP Handover

Framework for Interoperability

- **Prime contractor delivers complex asset to owner, plus large amount of support information (in many formats).**
- **Huge challenge for owner to gain consistent view across the complete & varied data set.**
- **LSC produced a Product Information Explorer (PIE) and demonstrated that PLCS has the capability to provide an integrated view across the TDP items and sources.**
- **Included:**
 - Integration of AP203 alongside AP239 for linking 3D model geometry to
 - Product structure
 - LSAR
 - Technical Documentation
 - Recently integrated AP212 for electrical routing and device information
- **Information is presented in context of defined product structures - allows easy & consistent method of access to wide breadth of data (e.g DB's, spreadsheets, text files, xml files, Step files etc..**
- **Such a range is necessary for typical complex asset**

Early Implementations - Lean Logistics Model (completed mid 2005)

Currently:

- **Many independently developed logistic processes and systems evolved to meet single Service requirements**
- **Different generations of IS**
 - Holding a wealth of logistics data locked in many IS stove-pipes - in different proprietary formats
 - Increasingly provided by industry in both acquisition and in-service.

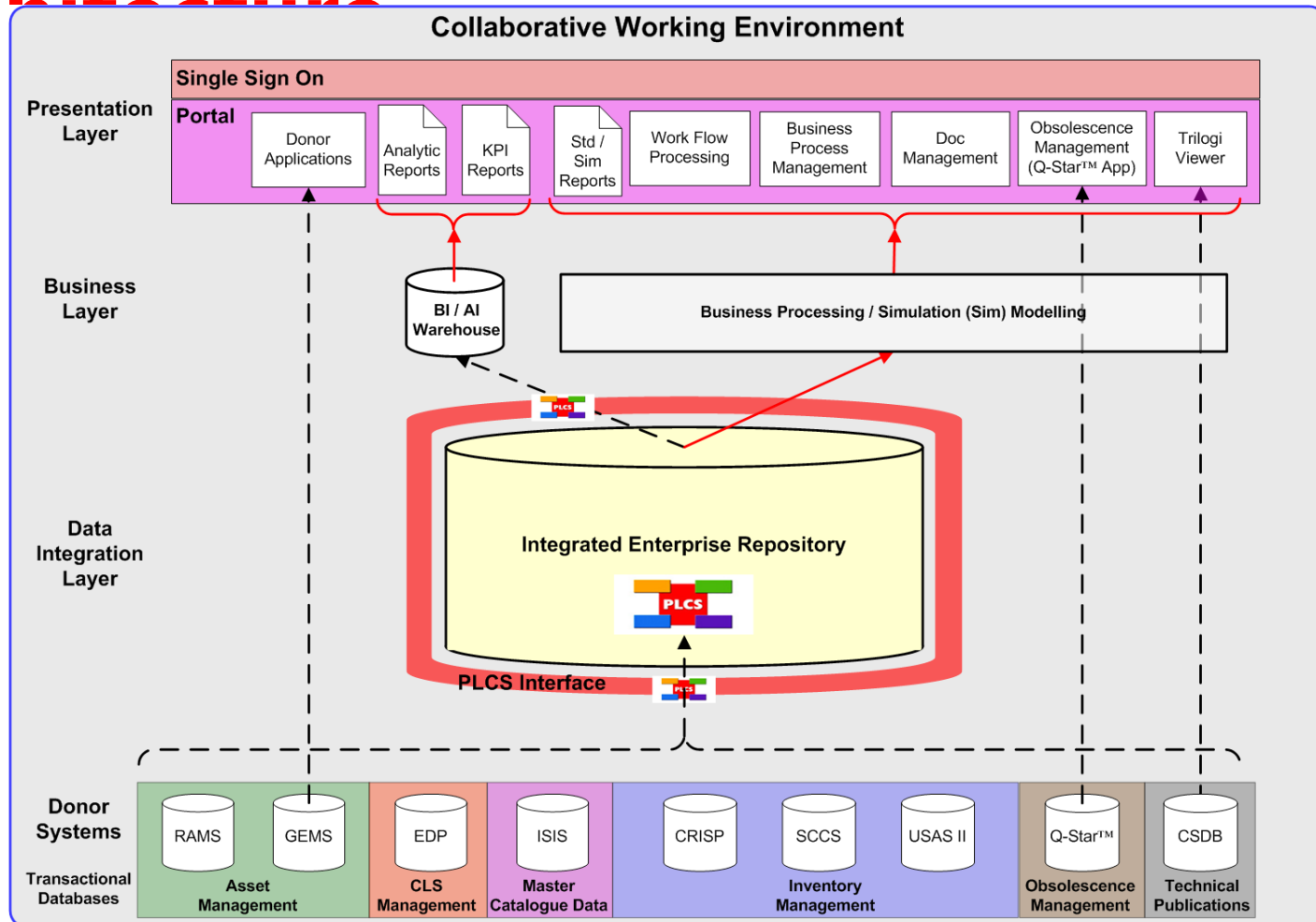
Need:

- **Open standards based logistics system integration to create a coherent data repository as the basis for improved E2E business workflow and management**
 - Automation; Standardisation; E2E; Auditable
 - Filtering; Exception reporting; Decision support; Through Life

LSC Solution:

- **AP-239 as central repository to gather data from 10 donor systems using PLCS adaptors as required**
- **Tied PLCS integration with a Collaborative Working Environment to support workflow & business process intelligence**

Early Experiences - LLM PoC Architecture



The LLM PoC CRP....

- **Demonstrated the concept of open architecture integrated logistics IS.**
 - It is not a product that can be bought off-the-shelf.
- **Is a methodology for integration of the outputs of legacy and new logistics IS, whatever the function.**
 - It does not replace current or future IS applications.
- **Harnesses the enabling technologies of business process automation, data warehousing and PLCS.**
 - MoD has already invested in some of the components.
- **Showed how business processes can be improved, standardised, automated and supported by consistent, coherent information.**
 - It enabled but does not prescribe new processes for implementation.

Lessons Learnt

- **Successful Implementations**
- **Quality of Data**
- **Technologies**
- **Evolving Architecture**

Lessons Learnt - Successful Implementations

- **AP-239:**
 - AP is more than capable
 - Has met expectations for many projects
 - Asset Management
 - RAF and Engine OEM exchange covering config, history, feedback, maintenance
 - Contractor Logistic Support
 - E-Logbook for Navy Ships and OEM. Integrates config. and records
 - Support Solution Engineering
 - Mapping 00-60 LSAR
 - Work Package Management
 - Maintenance management system -> ERP
 - TDP Handover
 - Integration framework for TDP data sources
 - Lean Logistics Model
 - Integration environment for reasoning over distributed databases

Lessons Learnt - Data Quality

Quality of Data

- **Lack of a vision for future requirements and extensible classification mechanism.**
- **Means many existing & legacy data sources have resorted to;**
 - work arounds
 - fixes
 - ..for data not anticipated when IS put in place
- **Impact: Implementation projects -**
 - Find inconsistencies in data
 - Team query problem in mappings, representation, model etc.,
 - Query remaining data validity
- **Need test case data validated BEFORE being used in projects**
- **Validation will remove/cleanse erroneous data both for project, owner, will reduce downstream errors and clarify requirements and upgrade needs.**

Lessons Learnt - Caution

Caution:

- **Previous experiences mainly based upon schema as whole**
- **Or on DEXs whose scope has changed since implemented**

Current UMMS work will update DEX4 in coming weeks

- **mapping updated to reflect new DEX**
- **Will enable other implementation work to re-use**
 - E.g. potential for E-logbook to exchange Work Package as part of CLS

Lessons Learnt - Conclusions

Conclusions:

- **Meets expectations**
- **Powerful capabilities**
 - Templates provide consistent re-use of capabilities and
 - Removes implementation interpretations
 - Makes generation of business concepts more attractive, but
 - Still rather complex for average person to generate templates
- **Testing forum needed**
 - Test DEX implementations
 - Discuss conformance
 - Discuss DEX interoperability
- **Re-Baseline generic DEXs**